Notice No.1

Rules and Regulations for the Classification of Ships using Gases or other Low-flashpoint Fuels, July 2016

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: June 2017

Amendments to	Effective date	Mandatory Instrument
Part A, Section 2	Corrigenda	NA
Part A-1, Section 5	1 July 2017	Yes
Part A-1, Section 6	Corrigenda	NA
Part A-1, Section 7	Corrigendum	NA
Part A-1, Sections 7, 8 & 9	1 July 2017	Yes
Part A-1, Section 10	Corrigendum	NA
Part A-1, Sections 10 & 11	1 July 2017	Yes
Part A-1, Section 12	Corrigendum	NA
Part A-1, Sections 12, 14 & 15	1 July 2017	Yes
Part B-1, Section 16	Corrigendum	NA

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Part A

■ *Section 2*
General

2.1 Application

LR 2.1-07 Class notation and descriptive note

LR 2.1-07b
If a ship has been assigned the **LFPF(GF, NG)** notation then it will not be eligible for the **GR** descriptive note. It ~~should~~ is also to be noted that further appraisal against the Statutory and LR requirements at the time of commissioning followed by testing and commissioning under survey will be required if assignment of the **LFPF(GF, NG)** notation is requested.

LR 2.1-08 Plans and information to be submitted

LR 2.1-08a The following are to be submitted to achieve **GR** descriptive note with applicable associated characters:

(b) **GR(S) 'Structural Reinforcement'**
Full details of the structural reinforcement required to support the proposed natural gas fuel tanks are to be submitted. This ~~should~~ is to include details of the proposed fuel tank type, size, location and loadings (dynamic and static) to allow verification of the submitted structural design and calculations for the tank support arrangements. Special consideration will be given for designs using Type B and membrane tanks and additional information may be required.

Part A-1
Specific Requirements for Ships Using Natural Gas as Fuel

■ *Section 5*
Ship Design and Arrangement

5.2 Functional requirements

5.2.1 This chapter is related to functional requirements in 3.2.1 to 3.2.3, 3.2.5, 3.2.6, 3.2.8, 3.2.12 to 3.2.15 and 3.2.17. In particular the following apply:

.2 fuel containment systems, fuel piping and other fuel sources of release shall be so located and arranged that released gas is ~~lead~~ led to a safe location in the open air;

5.3 Regulations – General

5.3.4 As an alternative to 5.3.3.1 above, the following calculation method may be used to determine the acceptable location of the fuel tanks:

.2 The f_{CN} is calculated by the following formulation:
$f_{CN} = f_l \times f_t \times f_v$

where:
f_l is calculated by use of the formulations for factor p contained in *SOLAS regulation II-1/7-1.1.1.1*. The value of x1 shall correspond to the distance from the aft terminal to the aftmost boundary of the fuel tank and the value of x 2 shall correspond to the distance from the aft terminal to the foremost boundary of the fuel tank.
f_t is calculated by use of the formulations for factor r contained in *SOLAS regulation II-1/7-1.1.2*, and reflects the probability that the damage penetrates beyond the outer boundary of the fuel tank. The formulation is:
$f_t = 1 - r(x1, x2, b)$ [footnote 6]
f_v is calculated by use of the formulations for factor v contained in *SOLAS regulation II-1/7-2.6.1.1* and reflects the probability that the damage is not extending vertically above the lowermost boundary of the fuel tank. The formulations to be used are:
$f_v = 1.0 - 0.8 \cdot ((H - d) / 7.8)$, if $(H - d)$ is less than or equal to 7.8 m. f_v shall not be taken greater than 1.
$f_v = 0.2 - (0.2 \cdot ((H - d) - 7.8)/4.7)$, in all other cases f_v shall not be taken less than 0.

where:
H is the distance from baseline, in metres, to the lowermost boundary of the fuel tank; and
d is the deepest draught (summer load line draught).

■ *Section 6*
Fuel Containment System

6.3 Regulations – General

LR 6.3-02 The probable maximum leakage ~~should~~ is to be agreed with LR.

6.4 Regulations for liquefied gas fuel containment

LR 6.4-19 LR ~~should~~ is to be consulted for guidance on the relevant combination of loads to be taken into account in the analysis ~~and this should be done~~ at as early a stage as possible.

LR 6.4-20 Plastic deformation analyses ~~should~~ is to be conducted in accordance with an agreed recognised Standard.

LR 6.4-37 The lateral and torsional stability of stiffeners ~~should~~ is to comply with the requirements of *Pt 4, Ch 9,5.6* of the Rules for Ships.

LR 6.4-38 The scantlings of the fuel tanks are to comply with the requirements of LR 6.4-39 and the following:

(j) Where the fuel tank boundary scantlings are based on the internal pressure head, Z_β, measured with respect to the non-perforated internal bulkhead such as centreline bulkhead, the valve(s) fitted in the bulkhead ~~should~~ are to normally be kept closed and only be used for levelling operations. This is to be indicated in the operational manual required in 18.2.

LR 6.4-39 In accordance with 6.4.15.1.2.3 tank boundaries and transverse wash bulkheads, where fitted, ~~should~~ shall be able to withstand a collision force acting on the tank supports in the forward and aft directions without deformation likely to endanger the tank structure, *see* 6.4.9.5.1

■ *Section 7*
Material and General Pipe Design

7.3 Regulations for general pipe design

7.3.2 Wall thickness

7.3.2.1 The minimum wall thickness shall be calculated as follows:

$t = (t_0 + b + c) / (1 - a/100)$ (mm)

where:

t_0 = theoretical thickness

$t_0 = PD / (2.0Ke + P)$ (mm)

with:

e = efficiency ~~factory~~ factor equal to 1.0 for seamless pipes and for longitudinally or spirally welded pipes, delivered by approved manufacturers of welded pipes, that are considered equivalent to seamless pipes when non-destructive testing on welds is carried out in accordance with recognized standards. In other cases an efficiency factor of less than 1.0, in accordance with recognized standards, may be required depending on the manufacturing process;

7.4 Regulations for materials

Table LR 7.1

LR 3 Stress corrosion cracking can occur in tanks carrying natural gas contaminated with hydrogen sulphide. In order to minimise this risk, it is recommended that tanks intended for the carriage of this substance ~~should be~~ are constructed in steel with a specified minimum tensile strength not exceeding 410 N/mm^2. If steels of higher tensile strength are used, it is recommended that the completed fuel tanks or process pressure vessels are given a suitable stress relieving heat treatment in order to reduce the hardness of the weld metal and heat affected zone to 250 Vickers Pyramid Number maximum (HV).

■ *Section 8*
Bunkering

8.5 Regulations for bunkering system

8.5.5 Bunkering lines shall be arranged for inerting and gas freeing. When not engaged in bunkering, the bunkering pipes shall be free of gas, unless the consequences of not gas freeing ~~is~~ are evaluated and approved.

■ *Section 9*
Fuel Supply to Consumers

9.4 Regulations on safety functions of gas supply system

9.4.10 For each main gas supply line entering an ESD protected machinery space, and each gas supply line to high pressure installations means shall be provided for rapid detection of a rupture in the gas line in the engine-room. When rupture is detected a valve shall be automatically shut off. [footnote 17] This valve shall be located in the gas supply line before it enters the engine-room or as close as possible to the point of entry inside the engine-room. It can be a separate valve or combined with other functions, e.g. the master valve.

Footnote 17
The shutdown ~~shall~~ should be time delayed to prevent shutdown due to transient load variations.

■ *Section 10*
Power Generation Including Propulsion and Other Gas Consumers

10.3 Regulations for internal combustion engines of piston type

LR 10.3-03 The safety concept is to demonstrate that all potential hazards associated with gas accumulation in the crankcase have been considered and ~~should~~ shall include but is not limited to the following:

10.5 Regulations for gas turbines

10.5.1 Unless designed with the strength to withstand the worst case over pressure due to ignited gas leaks, pressure relief systems shall be suitably designed and fitted to the exhaust system, taking into consideration of explosions due to gas leaks. Pressure relief systems within the exhaust uptakes shall be ~~lead~~ led to a safe location, away from personnel.

■ *Section 11*
Fire Safety

11.3 Regulations for fire protection

11.3.7 If an ESD protected machinery ~~spaces~~ space is separated by a single boundary, the boundary shall be of A-60 class division.

11.7 Regulations for fire detection and alarm system

11.7.1 A fixed fire detection and fire alarm system complying with the Fire Safety Systems Code shall be provided for the fuel storage hold spaces and the ventilation trunk ~~for fuel containment system below deck~~ to the tank connection space and in the tank connection space, and for all other rooms of the fuel gas system where fire cannot be excluded.

■ *Section 12*
Explosion Prevention

12.3 Regulations – General

LR 12.3-08 Where insulating materials are used to protect against the effects of high surface temperatures, they ~~should~~ are to prevent the ingress of gas.

12.3.3 Electrical equipment fitted in an ESD-protected machinery space shall fulfil the following:

.2 all electrical equipment in a machinery space containing gas-fuelled engines, and not certified for zone 1 shall be automatically disconnected, if gas ~~concentrations~~ concentration above 40% LEL is detected by two detectors in the space containing gas-fuelled consumers.

■ *Section 14*
Electrical Installations

14.1 Goal

The goal of this chapter is to provide for electrical installations that ~~minimizes~~ minimize the risk of ignition in the presence of a flammable atmosphere.

14.3 Regulations – General

14.3.7 Arrangements shall be made to alarm in low-liquid level and automatically shutdown the motors in the event of ~~low-liquid~~ low-low liquid level. The automatic shutdown may be accomplished by sensing low pump discharge pressure, low motor current, or low-liquid level. This shutdown shall give an audible and visual alarm on the navigation bridge, continuously manned central control station or onboard safety centre.

■ *Section 15*
Control, Monitoring and Safety Systems

15.4 Regulations for bunkering and liquefied gas fuel tank monitoring

15.4.10 For submerged fuel-pump motors and their supply cables, arrangements shall be made to alarm in low-liquid level and automatically shutdown the motors in the event of ~~low-liquid~~ low-low liquid level. The automatic shutdown may be accomplished by sensing low pump discharge pressure, low motor current, or low-liquid level. This shutdown shall give an audible and visual alarm on the navigation bridge, continuously manned central control station or onboard safety centre.

15.8 Regulations for gas detection

15.8.1 Permanently installed gas detectors shall be fitted in:

.10 ~~or~~ at ventilation inlets to accommodation and machinery spaces if required based on the risk assessment required in 4.2.

15.11 Regulations on safety functions of fuel supply systems

Table 1: Monitoring of gas supply system to engines

Parameter	**Alarm**	**Automatic shutdown of tank valve[6])**	**Automatic shutdown of gas supply to machinery space containing gas-fuelled engines**	**Comments**
Fire detection in ventilation trunk f~~or fuel containment system below deck~~ to the tank connection space and in the tank connection space	X			

Part B-1

■ *Section 16*
Manufacture, Workmanship and Testing

16.5 Testing

LR 16.5-05 The design pressure is not to be exceeded at any point, and the test ~~should~~ is to adequately load all areas of the tank. *See also Pt 3, Ch 1,9.6.2* in the Rules for Ships. When testing takes place after installation of the tanks on board ship, care is to be taken that the test head does not result in excessive local loading on the hull structure. For this purpose, when the fuel tanks are centrally divided with a non-perforated bulkhead, consideration will be given to testing the port and starboard sides of the tank independently.

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Published by Lloyd's Register Group Limited
Registered office (Reg. no. 08126909)
71 Fenchurch Street, London, EC3M 4BS
United Kingdom

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